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PROGRESSIVE CONTINUITY.

An appeal is made to readers, more especially to those of the farming class, to avail themselves of the advice given in the articles which appear in this Journal from time to time, whether they be on rice cultivation or on that of the sugar-cane.

For an agricultural country to be progressive, there must be a united force at work so directed as to ensure progress, however gradual, yet continuous.

Progressive continuity in agriculture depends:—

Firstly, on the accumulation of experimental data, the result of carefully thought out plans worked on modern principles.

Secondly, the transference of these data into actual experiments.

Thirdly, the results of the experiments arranged so as to merge theories into established facts.

The success of every scientific worker depends on this being done—whether such work is conducted on medical or agricultural lines or directed mainly from the point of view of the sanitarian. In consequence the results recorded and the recommendations made thereon should receive the unstinted support of those whom they are intended to benefit. This support, given in many instances by laymen, renders the work of the scientist continuous and progressive. Co-operation then is essential to the success of individualism in scientific investigations.

Granted then that co-operation is a necessary factor for progressive continuity, it is advisable that in every farming district there should be the desire to work on such lines as to ensure success.

In this colony a large amount of scientific work is conducted with that object in view.

In each farming district there is to be found an agricultural instructor whose aim is to co-operate by means of advice given to farmers and so secure a greater measure of prosperity for the inhabitants of the district and the colony as a whole.

Lately this measure of co-operation has been extended, so that in addition to the district instructor there is an assistant, these together will enable the work in the interest of scientific agriculture to be more valued by those farmers to whom it is necessary to give a greater amount of personal supervision.

It is fortunate that a number of our schoolmasters, who received and still receive much assistance in agricultural science from the lectures which are delivered to them during each year, take a keen interest in village administration, many occupying the position of chairman to the village council; as they assist to a very great extent this co-operative movement in the agricultural life of our villages.

There is a loan bank in most of the farming districts, by means of which the Government endeavours to further co-operate with farmers thus enabling them to become independent. Much of the good work of an agricultural department has been retarded by farmers being more or less in financial difficulties. This movement then is of great value to an agricultural country.

The article on seed selection which is published in this issue is, therefore, of special value to farmers.

It should be the aim of those engaged in agriculture to obtain the maximum yield per acre, and as rice and corn are most needed for conversion into flour at the Vegetable Products Factory, it would be to their advantage to co-operate and work on scientific lines so as to obtain the best results.

The fact, however, that much of the success hoped for depends on the assistance received through lands being properly irrigated and drained, has not been over-looked.

NOTES ON SEED SELECTION.

By W. H. Matthews, Agricultural Instructor, Pomeroon.

The following notes on seed selection as regards some of the crops grown locally have been prepared with a view of helping those engaged in tilling the soil to get the best possible results from their labours. For without doubt seed selection plays a most important part in the yield obtained; poor yields being due, in the majority of cases, to lack of attention to seed selection. And if it be true that the seed perpetuates the species, which undeniably it does, the importance of seed selection and the necessity for giving attention to it becomes at once patent to all; for which farmer would select seeds that give him poor, or at the most middling returns, when by choosing other seeds for planting he can get maximum yields? Yet strange though it might seem we still come across farmers, but the race is fast becoming extinct, whose intention of selection seems based on the ability of the seed to grow, instead of, on the producing power of the seed. This class of farmer is the exception to the rule—the rising generation of farmers are beginning to appreciate the value of seed selection as a means of bringing about increased yields. To these the hints given in this paper will be acceptable and for them are they written.

Two factors, applicable to every crop, should be kept in view when selecting seeds for planting purposes, viz: (1) The vigour and growth of the plant from which the seeds are to be collected, and (2) the fruitfulness or producing powers of the plant. For unless the mother plants possess these characteristics no amount of selection can produce them in the seed. Having made sure that the seeds have in them these characteristics separate from the sample all ill-formed seeds and seeds that are light in weight leaving as the final sample for planting only seeds that are uniform in size and weight. This will ensure an even stand of plants upon which maximum yields depend. For it does not require an expert to tell from which of two fields, equal in size and of like conditions, the greater

yield will be obtained whether from a field where the plants are of equal vigour and growth, or from a field in which the plants are of uneven growth and vigour.

In addition to the two factors governing selection of seed in the case of every crop, and given above, there are other factors that should be taken into account in selecting seeds, but as they differ in certain respects as regards different crops it is proposed to deal with one or two crops in order to illustrate this:—

Rice:— The value of seed selection has been well shown by the Board of Agriculture, seeds of rices that give the best yields being now available to farmers who on application to the Botanic Gardens can obtain samples for planting. But although the rices given are good yielders the farmer must continue selecting his seeds or else after a while he will find a falling off in the yields. For the purpose of assisting him in maintaining the yields the following hints are here given:—

Plant the rice received from the Botanic Gardens in new land, or, more correctly, land not previously planted with rice. The Board of Agriculture emphasises the importance of so doing. As soon as the plants are in full bearing and ready for cutting go through the field and cut the most vigourous growing plants with the largest heads, taking a sufficient number of them to meet the requirements of the next planting. Thresh these heads separately and select from the seed paddy, grains that are full and heavy, discarding ill-formed and light grains. A perfect sample of seed paddy should consist of grains uniform in size and weight. If this is done at each crop the yield of the rice will be kept up.

The Board of Agriculture lays emphasis on planting rices received from them in land not previously under rice as where the improved rices are planted in land from which other rices (inferior kinds) have been cut the previous season, there is danger of the seeds of the latter getting mixed up with seeds of the former and so preventing best results from the improved rices. The danger lies in this way: Inferior rices (or the kinds formerly grown before

the Board of Agriculture supplied farmers with their rices) usually drop when ripe or in cutting, hence there are always dropped seeds left in the field after a crop of inferior rice is removed. When therefore seeds of improved rices are planted in a field from which a crop of inferior rices have been removed, the dropped seeds of the latter germinate and grow along with the seeds of the improved rices planted, becoming evident in the crop of paddy subsequently removed. Should no pains be taken in removing the inferior rices, they increase with each crop both from the dropped seeds and planted seeds until the sample of improved rice first planted is unrecognisable. Their yields also falling off appreciably. To separate the inferior rices from the improved rices under such conditions, involves much work, hence it pays to plant the improved rices in land not previously under rice. In order to assist farmers who have got themselves in a muddle with their rices, but are desirous of separating the improved rices from the inferior rices, be it stated that the latter consist of either barley-shaped grains or grains of a blackish colour. Remove these from the sample for planting and you will have left a fairly pure sample of improved rice from which continuous selection of seed at the end of each crop, as stated above, will eventually evolve a very pure sample. The rice beds in which the mixed rices were growing should also receive attention so as to eradicate the inferior rices; have these forked and covered with water of sufficient depth and for a long enough time to kill any growth in the beds, after which rice could again be planted, first, however, allowing the soil to air.

Corn.—The next grain crop in importance to rice is corn, and here selection involves many more points than rice. First we have to consider the size and shape of the ear, then the length or depth and shape of grain. Next the length of grain as compared with the diameter of the cob and several other things which we will consider under their several heads in due time. Selection is begun in the field as soon as the ears are well formed on the stalks as follows:—Go through the field and wherever a

large well-formed ear is noticed on a sturdy well-developed stalk, mark the stalk with a piece of coloured cloth so that the ears could be easily located when they are ripe. More ears than are actually required should be selected and marked in order to allow for discardment of those that do not pass subsequent tests. In going through the field it will be observed that while some stalks have only one ear, others bear two. Selection should preferably fall on stalks producing two ears, provided the ears are large and well-formed, otherwise confine attention to stalks producing one large well-formed ear. Preference is given to stalks producing two ears as in this case a larger yield would be obtained than would be the case when stalks producing only one ear is selected. There are other stalks which produce 3 or 4 ears but seldom more than two of them mature, hence it is of no advantage selecting from these. When the corn is ripe the selected ears are first plucked and put away separately from the rest of the crop, as selection for seed is to be made from these. The selected ears are then husked and further selection made as follows :—

(a) *Ears.*—Note first shape of ears. The desired shape is a cylindrical one or one nearly so; for a cylindrical-shaped ear is likely to contain more grains than a tapering ear. Next note that the ears selected are filled with grains both at the tip and butt ends. The rows of grain on the ear should run parallel and should not have too much space between them. As regards size, ears should be medium, neither too long nor too short, and proportionate as regards circumference.

(b) *Grains* :—The length or depth of grain should also be taken into account. Where the grains are long there is less cob to grain than where the grains are short. By cutting across the cob the length of grain as compared with the diameter of the cob will be seen. The length of grain should be about half the diameter of the cob or nearly so. Corn is grown for the grain, hence it is desirable to produce more grain than cob. This makes attention to the length of grain to be used as seed, important. Grains of a slight wedge shape should be selected

as they allow little space between the rows and the top of the grain should be nearly flat. The tip of the grains chosen must also show health and vigour and it is wise to discard those with blackened tips. The colour of the grains on an ear chosen should be uniform as this indicates trueness to type and the colour of the cob on which the grains are borne should also be noted. Thus yellow grains should be borne on red cobs; white grains on white cobs; and red grains on reddish-yellow cobs.

Lastly be sure that the ears chosen are perfectly ripe ears and to test whether they are so twist them in the hands. If they do not twist easily they are perfectly ripe but if they twist easily they are not ripe.

When a sample has been procured that answers all these requirements, see before planting that the grains are all uniform in size weight and colour. Uniformity in size, and weight is important so as to get an even stand of plants, for as already mentioned maximum yields depend upon this, while uniformity in colour as indicating trueness to type also ensures maximum yields.

Peas.—Selection in this connexion embraces the selection of large well-filled pods from vigorous growing and fruitful plants. Selection of pods should be made from those that first ripen and which are borne on plants possessing the above characteristics as these are usually the best filled and largest pods. After the pods have been selected they should be shelled and seeds uniform in size and weight taken for planting purposes.

Plantains.—Although plantains are not propagated by means of seed and may botanically be objected to for being included in a paper treating of seed selection, yet when everything is considered whatever seems to perpetuate the species can be included under the term "seed." Thus a sucker as in the case of plantains, or a cutting as in the case of cassava, or a bulb as in the case of onions can correctly be discussed under the heading of seed selection. This is, however, by the way. Plantains, therefore, though not propagated by means of seed proper but by means of suckers are yet benefited by selection. The method of selection to be followed in this respect is to

choose suckers with short, narrow sword-like leaves in preference to suckers with long and broad leaves. Suckers with the short narrow, sword-like leaves grow vigorously when planted out and give quicker returns whilst bearing large bunches; suckers with the long and broad leaves on the other hand grow slowly and do not give quick returns, and the bunches borne are smaller. In establishing a plantain farm it is not, however, always possible to get suckers of the kind above recommended. The farmer seeking suckers has to take what he can get. In such a case bottoms should be taken as they are more or less available and when planted give off suckers of the kind recommended. By thinning out these a sufficient number of vigorous growing suckers will be obtained for planting purposes. There are two varieties known to farmers as the "black stem" variety and the "white stem" variety. Of the two it has been observed on farms where disease happened to be that the "black stem" plantain is generally affected to a less degree than the "white stem." It is advisable, therefore, in case of disease, to plant sparingly suckers of the "white stem" plantain, and more largely suckers of the "black stem." This will help in controlling disease, provided of course that other means of control are practised.

The above are hints on seed selection as regards some of the perishable crops grown and farmers and others will find them useful in the bringing about of higher returns. Seed selection as regards permanent crops is, however, much more important, for if a farmer by non-attention to selection gets poor returns, he cannot rectify his mistake. In the case of annual crops he can rectify his mistake by attending to seed selection the next crop, but where crops last for years after once planting is done it is necessary to give attention to seed selection once and for all at the time of planting.

The above are the methods to be followed in selecting seeds as regards some of the annual crops grown locally. And if seed selection is so important as regards annual crops it is much more important when we come to consider it in connexion with permanent crops. For be it remembered

that if by failure to select seeds we get poor crops we can in the case of annual crops profit by our mistake and rectify our error when planting the next crop. But not so in the case of permanent crops. We must therefore once and for all select at the time of first planting, otherwise our mistake is irreparable as permanent crops once planted live and bear fruits for periods ranging from 20 to 100 years, and more. Four permanent crops of great importance are dealt with in the following notes, namely : Coconuts, Coffee, Cacao and Rubber.

Coconuts: Much attention is at present being directed to coconuts, but little attention is being paid to the chief factor of success in the cultivation of this crop, namely seed selection. Yet the yield of nuts could be considerably increased per acre were more attention given to seed selection. First see that the parent plant is healthy. The age should be 20 years or above as trees that live to this age can be considered as desirable plants not having Bud-rot inherent at least, in them. The plant chosen should bear fair to good crops of medium size round nuts. Large nuts are not desirable as the number borne per tree is likely to be less than in the case of medium size nuts. Always let the nuts drop for raising plants from. A dropped coconut is perfectly ripe and is light enough to fall from any height without injury to itself. Coconuts for planting should be light in weight when balanced in the hand and when shaken the water in it should give forth something of a rattling sound.

Coffee: Coffee is also attracting some attention, the variety most in favour being the Liberian variety and rightly so as only from this variety are remunerative returns got. As before, the parent tree should be a prolific bearer of vigorous growth with berries of fair size having thin skins outside and large beans within. Some coffee berries though large have small beans, the skin taking up more than half the berries. Berries with thin skins and large beans are therefore to be preferred,

Cacao : More attention would be devoted to Cacao cultivation were farmers more alive to the good results obtainable from seed selection. Less labour is required in caring

for a cacao cultivation than a coffee one and the process of converting the fruits into the finished product for the market is also less intricate. First see that the plant you intend to take seed from is a good bearing plant of vigorous growth. Next examine a pod and note whether the skin is thick and the mass of beans inside is small in bulk, or whether the skin is thin and the mass of beans inside is greater in proportion than the skin, choose, of course, the latter as where the skin is thin there are more beans inside than where the skin is thick. Select as final products for planting only the largest and plumpest seeds Wash them and air-dry before planting to avoid their being carried away by rats and other pests.

Rubber: The desideratum in planting Rubber trees is to get as much latex as possible from the plants. To get the best results, therefore, trees giving good flowers should be aimed at. To do so note the best running trees and use these as the parents of new plants. Knock off all blossoms at flowering time from trees not required as parents leaving the blossoms on those trees only from which seeds are wanted. This ensures that the seeds dropped are from the trees selected as parents. Were this not done it would be impossible to tell the seeds from the good flowering trees as Rubber trees have the habit of scattering their seeds when ripe by the explosive method, that is, the pods burst and in bursting eject the seeds for considerable distances from the trees thus causing mixing up of the seeds. Knocking off the blossoms from all trees save those from which seeds are desired and is the only way to ensure that the seeds dropped are from the trees selected as parents.

EFFICIENCY AND CAPACITY.

Much has been written in regard to the relative value of "Efficiency and Capacity" in the cultivation of the sugar cane.

Noel Deerr in his article on the manufacture of sugar in Cuba enters into an elaborate discussion on this very important branch of the sugar industry and from the commercial point of view mentions the advantages of efficiency.

By efficiency is meant improved machinery.

By improvements in the machinery in a sugar factory the management aims at an increase in the sugar production due to increased extraction of juice.

In Cuba an increase of 10·0 per cent. is looked on as a certainty and this gives a return of 90·0 per cent. on the money expended on up-to-date machinery on a year's work—it must not, however, be forgotten that conditions differ in other sugar producing countries and therefore the benefit derived varies.

By capacity is meant increased area under cultivation which naturally gives a larger return on the work for any one period.

It has not been made quite plain whether those advocating an increase in the area under cultivation of the sugar cane in Cuba, have taken into consideration additional expenses incurred, and that these expenses are subjected to fluctuation as regards the number of acres in cultivation on estates, but it would appear that no consideration has been given to a limit being placed on the number of additional acres which can be cultivated as well as their respective yields.

Those who control the work on Experiment Stations are not concerned so much, however, with the relative value of efficiency and capacity but more especially the ultimate increase in the yield per acre of high grade sugar.

This is of the utmost value to both advocates of efficiency and capacity as without a reliable supply of canes, the sucrose content of which is maintained, the increase in the extraction per cent, due to improved machinery, would not be justified, and on the other hand a reliable cane grown on the increased acreage is ensured.

To obtain this desired result a study of plant physiology, morphology, is necessary as well as the chemistry of the soil. These have each to be studied under varying conditions in regard to climate and locality, consequently this work is of the greatest importance to an agricultural country and those in charge should receive the well-merited support of all persons interested in scientific agriculture.

K.D.R.

A REVIEW OF THE WORK OF THE BRITISH GUIANA SUGAR PLANTERS' EXPERIMENT STATIONS COMMITTEE FROM JUNE, 1919, TO DATE.

At a meeting of the British Guiana Sugar Planters' Association held on June 30th, 1919, the following were present: Hon. Professor J. B. Harrison, C.M.G., M.A., Messrs. R. Strang, W. M. B. Shields, A. E. Bratt, A. E. Craig, J. C. Gibson with J. C. McCowan, Secretary.

Mr. Strang stated that a Committee of five had been appointed by the Association to meet Professor Harrison and discuss all matters and make all arrangements for dealing with the extension of sugar cane experiments in the Colony and to have authority to make whatever appointments were considered necessary.

Professor Harrison considered that, in addition to the station at Georgetown, it would be necessary to have one at Berbice, one at Essequibo and another on the West Coast, and it was said that suitable land for the purpose might be obtained at Plantations Blairmont, Berbice;

Taymouth Manor, Essequibo; and Uitvlugt, West Coast, Demerara.

Main points in connexion with the draft of the Ordinance were also discussed.

It was agreed that the Committee inspect the new land it was proposed to open at Sophia.

At the meeting of the Sugar Planters' Experiment Stations Committee held on the 18th August, 1919, the proposed draft ordinance termed the Sugar Planters' Experiment Station Ordinance, 1919, was submitted and each section gone through and revised.

A meeting was held on the 25th September, 1919, when the Chairman intimated that the ordinance dealing with the Stations had been passed by the Government unchanged.

It was agreed at this meeting to offer Mr. James Crabtree, M.Sc., F.I.C., the post of Superintendent of the Experiment Stations.

At the next meeting held on the 22nd November, the Chairman reported the receipt of a telegram from Mr. Crabtree accepting the position offered to him. As the result of a discussion on the Estimated Expenditure for 1920, it was agreed that the rate of assessment be 33 cents per acre.

On the 15th December the Committee paid a visit of inspection to Sophia. They came to the conclusion that the land would be very suitable for conversion into Experimental fields and decided to obtain a lease for the 51 acres.

The Committee recommended that in future, a larger number of seedling canes be grown than hitherto so that tops in good condition could be obtained for distribution without interfering with the growing of canes for experimental purposes. They also suggested that the importation of foreign varieties for trial here be encouraged.

At the meeting held on the 2nd Feburary, 1920, it was reported that His Excellency the Govenor had approved of the appointment of Mr. C. L. C. Bourne, as Assistant

Secretary from 1st January, to 30th June, 1920, and Secretary from 1st July.

It was agreed that the position of field manager at Sophia be offered to Mr. J. P. Bastians who would immediately supervise the clearing of the land for cultivation.

At the next meeting held on Monday, 23rd February, Mr. Bastians' acceptance of the post of field manager was reported.

It was agreed, on the motion of the Chairman, that the Journal of the Board of Agriculture be used for the purpose of giving reports of the meetings of the Committee.

The Committee paid a further visit of inspection to Sophia on Monday, 15th March. They expressed their entire satisfaction at the manner in which Mr. Bastians had carried out the work of clearing the fields, dams, etc., and the progress he had made.

It was decided not to have any distribution of seedling canes this year but to have everything drawn down for planting at Sophia.

I assent.
C. CLEMENTI,
Officer Administering the Government,
24th September, 1919.

BRITISH GUIANA.

COURT OF POLICY,

ORDINANCE NO. 29 OF 1919.

An ORDINANCE to provide for the establishment and control of Sugar Experiment Stations. A.D. 1919.

30th September, 1919.

WHEREAS the Sugar Planters of this Colony are desirous of establishing, maintaining and managing Sugar Experiment Stations for conducting experiments in connexion with Cane and Sugar and the by-products thereof and for preventing the spread of Diseases in cane and otherwise for promoting the well-being of the Sugar Industry;

And whereas the said Sugar Planters have agreed to be assessed annually by the British Guiana Sugar Planters' Association for the purpose of meeting the expenses in connexion with such Experiment Stations;

And whereas the Sugar Planters consider that the scheme for giving effect to their wishes would be more effective if given statutory force, and have asked the Governor to legislate accordingly.

And whereas the Governor while deeming such legislation in the nature of private legislation, thinks that the establishment of such Experiment Stations will ultimately tend to the

benefit of the Colony, and deems it expedient to give effect to the wishes of the Sugar Planters;

Be it therefore enacted by the Governor of British Guiana, with the advice and consent of the Court of Policy thereof, as follows:—

Short Title.

1. This Ordinance may be cited as the Sugar Planters' Experiment Stations Ordinance, 1919.

Interpretation clause.

2. In this Ordinance unless the context otherwise requires,—

"The Committee" means the Committee appointed under the provisions of this Ordinance.

"The Fund" means the Sugar Planters' Experiment Station Fund, established under the provisions of this Ordinance.

"Proprietor" means the proprietor, whether jointly or severally, or the authorised agent of the proprietor, or the manager or person in charge, of any plantation or land under sugar cane cultivation.

"Secretary" means the Secretary appointed under this Oirdnance.

Appointment of Committee

3.—(1.) The British Guiana Sugar Planters' Association shall, as soon as possible after the passing of this Ordinance elect six persons immediately connected with the sugar industry of this colony to form with the Director of Science and Agriculture a Committee for the purposes of this Ordinance for the period ending 31st December, 1920, and on or before the 31st December, 1920, and of each year thereafter elect three such persons for the ensuing year.

(2) The Director of Science and Agriculture shall be, *ex officio*, the chairman of the

Committee and a permanent member thereof. In the absence of the chairman from any meeting the members present may elect a chairman for that meeting.

(3) The three members of the Committee first in order of election shall retire on the 31st December, 1920, and the other three members on the 31st December, 1921, and so on from year to year, but shall be eligible for re-election.

(4) Any vacancy occurring on the Committee between the dates of election as aforesaid shall be filled by the Committee subject to the approval of the British Guiana Sugar Planters' Association.

(5) The chairman and three other members of the Committee shall form a quorum for the due and proper exercise of all the powers and duties of the Committee.

Establishment of Sugar cane Experiment Stations.

4. The Committee may from time to time establish, maintain and manage such and so many Sugar Experiment Stations as in its opinion are necessary and may provide and equip the same with all buildings, laboratories, machinery, instruments, apparatus and all other matters and things necessary or proper for conducting experiments in connexion with cane and sugar and the by-products thereof, and for preventing the spread of disease in cane, and otherwise for promoting the well-being of the sugar industry.

Appointmnet of Superintendent and other Officers of Experiment Stations.

5.—(1) The Committee may from time to time appoint a Superintendent of Sugar Experiment Stations and may out of the fund pay to such Superintendent such salary and allowances as it thinks fit.

(2) The Committee may from time to time appoint a Secretary and such other officers as may be necessary for the effectual execution of the provisions of this Ordinance and may out

of the fund pay to such officers such salaries and allowances as it thinks fit.

Care and control of Experiment Stations

6.—(1) The Committee shall have the general direction and care and control of all such Sugar Experiment Stations.

(2) The Committee shall from time to time make or cause to be made such inquiries, researches, and investigations as are required by the British Guiana-Sugar Planters' Association and also such other enquiries, researches and investigations as it thinks fit in relation to any matters concerning the sugar industry.

Establishment of fund.

7.—(1) There shall be established a fund to be called the "Sugar Planters' Experiment Station Fund" out of which shall be paid all expenses incurred by the Committee in the carrying out of the provisions of this Ordinance.

(2) All assessments or other moneys received under this Ordinance shall be paid by the Secretary into the Colonial Bank or the Royal Bank of Canada to the credit of the Fund.

(3) All withdrawals of money from the Fund shall be by cheque signed by the Chairman and the Secretary and one of the other members of the Committee, or in the absence of the Chairman, the Secretary and two members of the Committee or in the absence of the Secretary by the Chairman and two other members of the Committee.

Assessment to be levied on land under cane cultivation.

8.—(1) The British Guiana Sugar Planters' Association may on or before the 30th September in each year assess upon all plantations and lands under sugar cane cultivation and recover from the proprietors thereof a rate not exceeding one dollar in respect of each acre of land under such sugar cane cultivation for the purposes of this Ordinance.

Provided always that no assessment shall be recoverable in respect of land under sugar cane cultivation, not exceeding twenty-five acres in extent and cultivated by one person.

(2) Such assessment shall be recoverable upon the basis of the area under sugar cane cultivation during the preceding twelve months ending 31st March, and for the purpose of calculating such area the mean shall be taken of the area under sugar cane cultivation, as shown by the returns furnished to the Commissioner of Lands and Mines under the Acreage Tax Ordinance, 1898, in respect of the two periods of six months comprising such aforesaid period of twelve months ending 31st March. No. 23 of 1898.

(3) Such assessments shall be payable to the Secretary each year in two instalments one of which shall become payable on the 1st day of October, and the other on the 1st day of March in the ensuing year.

(4) For the purposes of this section the Commissioner of Lands and Mines shall furnish the Secretary on or before the 1st day of September in each year with a certificate setting out the area under sugar cane cultivation on every plantation or other land as shewn by the returns referred to in sub-section (2) hereof.

(5) The Secretary may recover all assessments and sums due under this Ordinance by the proprietor of any plantation or land by parate or summary execution against such proprietor without naming such proprietor and a certificate purporting to be signed by the chairman stating the amount claimed shall without further proof of such signature or of any other matter or thing be held by all courts sufficient *prima facie* proof of the amount claimed being due.

Annual Report.

9. In every year the Committee shall publish a report upon the Experiment Stations and the administration of the fund under its control.

Power to Committee to make Regulations.

10.—(1) The Committee may from time to time make regulations for the purpose of carrying into effect the provisions of this Ordinance and may alter, amend or revoke any such regulations.

(2) Such regulations may impose a penalty of not exceeding one hundred dollars for any breach of any such regulations and all such penalties may be recovered in a summary manner before any Magistrate by any person authorised in writing by the Chairman of the Committee for that purpose.

(3) Such regulations and any alterations, amendments or revocations thereof shall not come into force or have any effect until approved of by the Governor-in-Council and published in the *Gazette* and thereupon shall have the force of law.

No parate execution against Crown or Colony lands.

11. Nothing in this Ordinance shall be construed or held to authorise any summary or parate execution against any Crown or Colony land.

Duration of Ordinance.

12. This Ordinance shall continue in force for ten years from the commencement thereof.

Passed the Court of Policy this 11th day of September, 1919.

G. BALL GREENE,
Clerk of the Court.

NOTES ON COLLECTION OF DRY FRUITS AND SEEDS.—*(Contd.)*

Bixa Orellana. "Arnatto," "Roucon," of the West Indies. The fruits are reddish echinate triangular capsules, 2-3 inches long and 2 inches wide, dehiscing from the apex in 3 valves which adhere at the base. The seeds arranged in the centre of the valves are covered with a deep red pigment which is largely used as a culinary colouring matter. The plant is a small spreading tree with brittle branches. Foliage ovate, pointed 6-7 inches long, 3-5 inches wide, sinuate, veins reddish, dark green tinged with red. Inflorescence in terminal panicles, with pale pink flowers about 1½ inches in diameter. Specimens Botanic Gardens.

Kleinhovia hospita, from the Moluccas. The fruit a 5 pointed bladder capsule ⅝ inch across, of thin tense texture. Seed very small, dehiscing by the 5 valves. A medium sized tree with spreading branches. Foliage broadly ovate, cordate, pointed, 5½ inches each way, much like the foliage of the European lime tree. The inflorescence a large terminal panicle with small pink flowers. Specimens Botanic Gardens.

Dodonaea viscosa. West Indian, the "Paper-flower" bush. The fruit a thin bladder-like capsule, heart-shaped or triangular, green, turning brown, papery, ¾ inch wide ⅞ inch deep, with a flat edge, and a deep notch at the apex, dehiscing in 2 valves, containing several small pea-like black seeds. It is a medium sized shrub with lanceolate foliage, dark green, 5 inches long, 1½ inches wide, midrib prominent, with close regular lateral ribs. The inflorescence a small, close, terminal panicle on side branches. Flowers small, greenish. Specimens from Essequibo.

Spathelia simplex, the "Mountain Pride of "Jamaica." The fruit a triangular papery capsule ⅞ inch long, ⅜ inch wide, one-seeded, indehiscent. The tree is a tall-growing

may-pole-like object, the stem not over 4 inches in diameter, with a tuft of some 2 dozen leaves at the top, drooping. The foliage pinnate, $3\frac{1}{2}$-4 feet long, of 30-40 pairs of pinnae, these sessile, auriculate, 6 inches long, an inch or more wide lanceolate, acuminate, the whole leaf falling and the pinnae, detaching at the same time. The inflorescence is a huge terminal panicle, some 3 or more feet high and spreading as much, much branched, smothered with small deep-pink flowers. In its flowering condition a most beautiful object, but without the inflorescence a scraggy thing. Specimens Trinidad.

Nelumbium speciosum, from India. "Water bean," "Lotus Lily." "Lake Nut." The fruit a thick leathery, brown capsule, shaped like an ordinary water-pot rose, 3-4 inches across the flat top, $1\frac{1}{2}$-2 inches deep, narrowing to the base, with perforations on the surface $\frac{1}{2}$-$\frac{3}{4}$ inch wide, inside of which the seeds are visible, these like tiny olives $\frac{5}{8}$x$\frac{1}{2}$ inch. It is an aquatic plant spreading all over the space where it is planted by means of strong running shoots. The first leaves float on the surface of the water, later on the subsequent leaves rise above the water, and form a veritable forest of foliage. These are 9-12 inches across, circular, peltate, pale green, veins plainly radiating from the centre and forking 3 times towards the edge. The inflorescence is a solitary large deep-red flower, at first in the form of a cone, opening out at last 6 inches across, showing plainly the embryo fruit encircled by yellow stamens, these are thrown up well above the foliage and form a magnificent sight, the brilliant flowers contrasting with the vivid clean foliage. The green seeds are eagerly sought for by children especially, and eaten fresh from the capsule, hence the term "Lake Nuts."

N. luteum, imported from Jamaica, bears cream-coloured flowers, and in the Botanic Gardens these two species cross fertilized—though they were a considerable distance apart and produced in a separate Lake hybrids of all shades between the deep pink and the cream coloured. Specimens, Botanic Gardens.

The skeleton of the seed of the "Golden Apple" "Pomme Cythese". *Spondias dulcis.* This is one of the botanical curiosities one meets with in almost everyday life, especially when the apples are in season, and yet unless the peculiarities were pointed out—like the skeleton of the Manchioneal fruit,—they would be passed by unnoticed. The seed occupies a large portion of the fruit, woody in the centre and ramifying all through the soft pulps with strong fibrous network, several strong tough strings running through the length of the fruit. A veritable curiosity! The "Golden Apple" tree is well known and provides a rather pleasant acid-flavoured succulent drupe, spherical, $2\frac{1}{2}$ x $2\frac{1}{4}$ inches, dark yellow, with a peculiar strong smell of its own. The foliage is pinnate 15-16 inches long, of $9\frac{1}{2}$-$10\frac{1}{2}$ pairs of leaflets, these oblong $3\frac{1}{2}$ x $1\frac{1}{4}$ inches, almost sessile, cross veins straight across and close together. Flowers small, white, in loose terminal panicles. Branches rather stout and brittle. Specimens, Georgetown.

Another skeleton curiosity of interest to strangers is the seed of the "Hog plum" or "Mombin" *Spondias lutea.* This would be much easier passed by than the other as it is much smaller. The seed with its fibrous network is only an inch long and half that diameter, but the network is like an exquisite piece of filigree. The fruit is very much sought after in its season although there is very little succulence to enjoy for it is but a trifle larger than the seed. It has quite a powerful rather acrid scent and taste, and always brings with it a full complement of bowel troubles.

The tree is large growing, the smaller branches pendant; foliage pinnate; flowers tiny, yellowish white, in large terminal panicles. Specimens, Georgetown.

Argemone mexicana. "Fico del Fuego," "Mexican Poppy." Specimen a dry capsule $1\frac{1}{4}$ inches long, $\frac{1}{2}$ inch wide, in 5 longitudinal sections, dehiscing at the apex, the divisional filaments arching over the top, crowned by the stigmas, short sharp white spines on surface of capsule. The seeds are many, tiny black. The plant is an annual 1-2 feet high, with ornamental green foliage,

midrib and main veins white, 5 inches long 2 inches wide, bipinnatifid. sections 1 inch deep, short-sharp white spines all over. Flowers terminal solitary, yellow, 2 inches diameter, of 6 broad petals, stamens yellow, numerous ½ inch long stigma large, purple. Specimens, Botanic Gardens.

A Mex Alba. This is rather a larger growing plant than the original, flowers 2½ inches across, pure white, with similar yellow stamens and large purplish stigma. Foliage bipinnatifid, 9 inches long, 5½ inches wide, the sections cut 2 inches deep; brown tipped spines on the leaves, short sharp spines on the midrib below. The whole plant a glaucous green with pale milky veins. The capsule 1½ inches long, ¾ inch across, strong spines, all over, the filaments arching over as in the other case, seeds small, black.—Specimens, Trinidad.

The "Soap-berry" tree, *Sapindus inequatis* S. America. The fruit a small one-seeded indehiscent capsule, ¾ inch diameter of honey substance, with a curious raised blunt protruberance like a small mouth. which on being blown into causes a whistling sound, bright brown; on being broken the substance of the capsule is soapy. It keeps its perfect shape on being dried intact. The seeds are black, round, ⅝ inch diameter, hard, with a white removable spot at the base. Inflorescence in terminal panicles: flowers small, whitish. Foliage pinnate of 3-4 pairs leaflets 5½-6 inches long, 2 inches wide, oblong, acuminate, unequal sided, dark green. A fair sized tree with strong branches. The capsules have been used for soapy material by washerwomen, and the seeds are locally used for making necklaces and rosaries. Specimens, Georgetown.

Clavija ornata from Caracas. Fruit specimens. The fruit a leathery ball 1 inch diameter, ¾ inch long, and so depressed, brownish red when ripe. otherwise dark green hanging in simple grape-like bunches, Seeds in a cluster 5 or 6, like a parcel of snail eggs, yellowish white ⅜ x ¼ inch, The plant is dialcious, growing in strong upright stems; the foliage of the female plant 2 feet or more long, broadly spathulate, the widest part 6 inches wide, this ¾ up the

leaf—tapering thence to the base, upper part oblong, pointed, edges waved and copiously toothed with sharp spines like Holly, dark coriaceous green, midrib prominent, shining above, pale beneath veins almost straight across fairly close; petiole 1 inch. The inflorescence a raceme 6 inches long, with small orange coloured flowers coming from the stems among the leaves. The foliage of the male plant is similar though smaller, straighter than that of the female plant, with smaller though quite as sharp spines. Inflorescence a similar raceme to the other sex but slightly longer, flowers orange, very small. Specimens from Trinidad.

Tectona grandis of India, the famous Teak-wood of Ship-building fame. Fruit specimens with seeds. The fruit a thin, crinkled. inflated, parchment-like capsule, an inch in diameter, drying rather smaller and depressed. Indehiscent; but easily decaying when damp, disclosing one seed; this with a hard centre covered with a coarse woolly exterior, only $\frac{1}{4}$ inch in diameter. Foliage large, tense and leathery, oblong, pointed, 12-15 inches long, 9 inches wide at middle; midrib and veins strong the latter wide apart, fine veins anastomosing everywhere like lacework. Inflorescence a large, terminal, compound panicle; flowers small, white. A large slow-growing tree with strong branches.—Specimens, Demerara and Trinidad.

Combretum laxum. West Indies. One of the bottle-brush flowering plants. The fruit is a papery 4-winged capsule, $1\frac{1}{4}$-$1\frac{3}{4}$ inches long, 1-$1\frac{1}{4}$ inches in diameter, brown. The fruits are not clustered; one narrow spindle-shaped seed 1 inch long in centre. The inflorescence a flat terminal panicle. The flowers all on the upper side, small, scarlet with long yellow stamens. Foliage in pairs, elliptical-oblong, 6 inches long, $3\frac{1}{4}$ inches wide. A medium climber, very showy when in bloom. Specimens, Botanic Gardens.

Combretum Secundrum, Trinidad. Another bottle-brush plant. The fruit a compact mass 4-5 inches long, $1\frac{3}{4}$ inches thick. Composed of single dark brown capsules $\frac{3}{4}$ inch long, with 4 wings in the shape of an X, spreading

a little over $\frac{1}{2}$ inch, attached to a single seed in the centre the whole mass looking like a fir cone with cupped compartments well open. Inflorescence axillary, racemose 6-7 inches long, composed of small flowers with long stamens of deep orange colour, and hnadsome inflorescence produced in profusion. Foliage in pairs, shortly patioled pale green, oblong $3\frac{1}{2}$ inhes by 2 inches, veins prominent slightly yellowish. A strong climber. Specimens from Trinidad.

Hevea brasiliensis. The Para Rubber tree, the fruit a tri-coccus capsule, $2\frac{1}{4}$ n wide by $1\frac{3}{4}$ inches long, with a thick skin which dries into 6 divisions shewing a hard woody case beneath, which eventually dehisces with a sharp report into 3 valves,—each valve splitting into 2 halves the inside of each forming the letter C,—ejecting the seeds, one to each valve; these are rather more than an inch long, and one by $\frac{3}{4}$ inch wide, depressed at the top, a decided mark (the raphe) down the front, rounded behind, greyish at first, darkening into pale brown on exposure, marked all over with dark brown blotches and spots. The inflorescens springs in a crown of narrow panicles at the terminals, the new foliage springing immediately above, the panicles varying 4-9 inches in length, branching $1\frac{1}{2}$-2 inches wide. Flowers monœcious, deep yellow, very small, the males much in excess of the females which are at the tips. Foliage trifoliolate; leaflets oblong-lanceolate, pointed, 6-9 inches long, $2\frac{1}{2}$-$2\frac{3}{4}$ inches inches wide, veins well marked, regular; petiolas 6 inches long, glands at the base of the leaflets. The tree is deciduous, large growing, forming a fine rounded head. For the purpose of tapping for the latex any branches which do not naturally fall off are cut away for a considerable distance up the stem. It may be mentioned that the fruit is not always tri-coccus, in a quantity of fruits exhibited by Mr. J. E. Beckett, at the Berbice Industrial Exhibition a few years since there was quite a number of fruits which possessed 4 cocci. Specimens Botanic Gardens and Berbice.

J. F. W.

PLANT DISEASES AND PESTS NOTES.

STORAGE OF MANURE AND FLY SUPPRESSION.

The fly menace to human health has frequently been the subject of comment in previous volumes of the *Agricultural News*. As is well known, flies lay their eggs in manure heaps in great quantities; there the larvae find food, and the pupae are developed. In Agricultural communities however, the preservation of stable manure is of prime importance. Any method therefore, whereby manure may be adequately stored, and yet flies be prevented from breeding in it, is worth consideration.

An article by Mr. Charles K. Brain, M. Sc., which appeared in the *Journal of Economic Entomology*, June 1918, drew attention to the measures which were taken with these objects at the huge Transport Depôt established in Natal during the war, and the success attained.

Although these operations were conducted on a huge scale, it would appear that similar success would be attained by similar measures in dealing with even small amounts of farmyard manure. Accordingly much of the article referred to above is here reproduced:—

During the existence of the Transport and Remount Mobilization Depôt which was established at Durban, Natal, in November 1915,in connexion with the military operations in German East Africa, approximately 100,000 animals, mostly horses, mules, and donkeys, passed through the depôt, and the average number maintained during most of the time was about 3,300, with a maximum at anyone time of 10,000. The chief interest, entomologically, lies in the fact that, although this depôt was situated on reclaimed swamp within fifteen minutes walk from the centre of the town, it has not caused the slightest inconvenience to the inhabitants, and there has been an entire absence of smell and house-fly nuisance.

It may be remarked that the climatic conditions of Durban are admirably suited to the rapid multiplication of house-flies, and the question of successfully storing large deposits of stable manure in close proximity to towns and camps has always been a difficult one, but one of particular importance.

The means employed for fly control consisted of constant attention to the collection of dung, none being allowed to remain for twenty-four hours, the systematic storage and packing of manure, and continuous spraying with poison bait and contact insecticide.

Every day the manure and litter from stalls and paddocks were swept up and carted to huge trenches previously prepared in the sand dunes. These trenches were dug to a depth of about 10 feet, i.e., down to the clay layer sublying the sand. They were often 20 feet wide and 50 to 70 feet long. The carting was done by a special staff of sixteen natives under a non-commissioned officer. The average amount was approximately 150 to 160 Scotch cart loads per day. This was spread out in the huge trench until a depth of about 1 foot was reached, when other boys proceeded to cover it with a thin layer ($\frac{3}{4}$ inch) of sand, ashes, or earth. It was arranged that in carting fresh material, it was necessary to pass and repass over the manure already spread, so that it became well pressed down, and, as new layers were added, each day's deposit received its coat of sand, and afterwards its rolling or ramming down. When a trench was filled it was covered with a layer of a foot or so of earth or sand, and then thoroughly rolled for two or three days. Disinfectants or lime were added. This method of storing produces a dense peaty mass of manure, which analysis shows to be of particularly good quality.

For sweeping manure from the stalls, hard brushes were used; and although the work was thoroughly done, there was always a number of flies around. To deal with these, four natives under a 'conductor' were constant-

ly treating them with a contact spray. The mixture used consisted of:—

Caustic soda	... 2 lb.
Boiling water	...50 gallons.
Paraffin	... 5 „ added whilst hot.
Hycol	... 5 „ „ „ „

An attempt was made with this actually to hit the settled flies, and it was found that a broad-bore garden syringe was more effective than an ordinary spray pump.

Fly bait consisting of:—

Arsenite of soda	... 5 lb.
Black sugar	... 5 to 20 lb.
Boiling water	...25 gallons,

was distributed on blue gum branches and pieces of sacking. These were placed in all latrines, dormitories, cook houses and stores, and were constantly renewed.

That the means adopted proved effective is well illustrated by the fact that on no occasion was the least inconvenience caused by the close proximity of the large number of animals in the depôt, nor by the thousands of tons of stored manure.

With regard to the above fly bait, the amount of arsenite seems excessively high. The usual quantity recommended for 25 gallons of water and the requisite amount of sugar would be about 2½lb., and as this quantity kills efficiently there would seem to be no useful purpose in increasing it. Too high a proportion of arsenite is reported by some workers to act as repellant, defeating the purposes of a bait.

—*Agricultural News.*

DEALING WITH RATS IN THE CANE FIELDS.

In the Australian Sugar Journal for March 13th, 1919, it is mentioned that of late there had been not much trouble with rats, which formerly had been so serious a menace to the cane growers.

Bananas and strychnine or cane and strychnine baits had given the best results. In one district, a portion of the Pest Destruction Fund was used for the purchase of strychnine and this was supplied to the farmers at cost price, together with aniseed. In another district a man was paid to go round to the different farms with prepared baits. Arsenic was found to be practically a failure, and although the rats took the baits, they almost invariably recovered. In an experimental cage, only one out of seven rats to which arsenic had been given was found to have died, whilst all the others recovered; but on the other hand strychnine was sudden death to them. Keeping the headlands of the cane clean was one of the best preventatives of the pest. The poison did its best work in the water courses. A loaf of bread, or bananas, or cane, an ounce bottle of aniseed and a bottle of strychnine would clean up any farm, if only the owner would act with care and persistence and keep following them up. Each new colony must be followed up until all are exterminated.

In view of the damage which can be done to canes by rats the above should be given a trial by those planters who are in need of a means of exterminating them.

MITES AND LICE ON POULTRY.

A contribution from the Bureau of Entomology, of which Dr. L. O. Howard is chief, on Mites and Lice on Poultry, furnishes much information which should be of value to poultry keepers.

As is pointed out external parasites are one of the most inportant factors operating to retard the development of the poultry industry. How far this has operated in this colony one has only to examine the small feathered stock which are to be found scattered over the many districts.

It is a difficult matter however, to determine which of the parasites are of greatest importance. Both lice and mites are found in practically every locality where poultry are raised. Where present in any considerable numbers both lice and mites reduce egg production and hinder the growth and reduce the quality of the flesh of all classes of poultry.

MITES.

The common chicken mite—*Darmanyssus gallinæ Degeer*.

As mentioned, poultry raisers are all too familiar with the common red or grey mite which infests poultry houses. Those making a speciality of poultry raising have little difficulty with mites, on the other hand, farmers and others who raise poultry as an incident to other operations frequently find their chicken houses overrun by mites. The attack of this blood-sucking mite is of an insidious nature which does not readily draw attention to its presence, and, often the poultryman is not aware of an infestation until he is attracted to it by the irritation produced by mites on his own body through coming in contact with infested coops. The presence of the pest may be determined readily by the detection of small areas on the boards specked with black and white as though dusted with salt and pepper. This is the excrement of the mites, which are hidden in adjacent cracks or rough places. More

careful examination will reveal masses of mites in hiding together with their eggs and the silvery skins cast by the young.

In poultry houses the injury to the fowls is not at once apparent but the constant blood loss and irritation are shown by decreased egg production and the poor condition of the flesh of fowls. In heavily infested coops it is not unusual for the chickens to become droopy and weak, with pale comb and wattles. Setting hens desert their nests and thus ruin the eggs or as is often the case they are found dead on the nest, being killed outright by the attack of thousands of mites. In extreme cases a considerable percentage of the fowls succumb even though not sitting, and all are so weakened as to be very susceptible to various diseases. Although many assert that dampness has much to do with the abundance of the chicken mite, experience has shown that the mite occurs in less numbers in humid areas.

LIFE HISTORY AND HABITS.

Blood is absolutely essential for the development of this mite in all stages. The mite feeds almost entirely at night, except that it often feeds on hens on nests. Chickens may carry a few mites (sometimes a hundred or more) in their feathers during the day following a night spent in infested quarters, but most of these leave the host during the following night. In some cases mites may remain on chickens during three days and nights but nearly all become engorged and leave them by the third night.

Within 12 to 48 hours after receiving a meal of blood the mature female deposits from three to seven pearly white and elliptical eggs laid singly in the cracks in which the adults are hiding. The operation of feeding and depositing is repeated as many as eight times, and from 25 to 35 eggs in all are deposited. These hatch in two days under certain conditions and one to two days later without feeding, the larvae shed their skins and become nymphs. With a very short rest these light-coloured nymphs engorge with blood, secrete themselves, and molt their skins

the second time 30—48 hours after having fed. These mites of the second nymphal stage soon engorge again shedding their skins one to two days later and becoming adults.

Thus the chicken mite reproduces very rapidly the life cycle from egg to adult requiring not more than seven days.

LENGTH OF LIFE.

Once infested at least four months and probably five will be required before all of the mites will starve if the chickens are removed from the house. In tests made some mites were still alive after a period of 113 days, and since these individuals were collected from an infested house it is not unlikely that they had matured some time previously. The test indicate that where the mites are supplied with a certain amount of moisture they will live longer than when kept under very dry conditions. This may account in part at least for the idea that mites are worse in damp and badly ventilated chicken houses.

HOSTS AND METHODS OF SPREAD.

Chicken mites do not feed to any great extent upon other hosts when chickens are at hand. They are carried about chiefly by the interchange of poultry and in crates and boxes in which fowls are shipped. No doubt clean premises sometimes are infested by mites carried on the clothing of people going from one chicken yard to another.

CONTROL.

Owing to the fact that mites feed during the night and secrete themselves in cracks and crevices during the day, their presence very often is overlooked until a very heavy infestation has developed. In such cases they should be attacked energetically. Although not hard to kill, the greatest obstacle is the difficulty of reaching them in their hiding places. Dust baths will not control them, as at most only the few which remain on the chickens during the daytime will be destroyed.

TREATMENT OF INFESTED HOUSES.

The first step necessary to destroy the mites is to get rid of the hiding places so far as possible. The roosts should be taken down and all unnecessary boards and boxes removed. In heavily infested houses the mites are found in all parts of the building including the roof. Where they are less numerous the infestations usually are confined to the roosts and nests and the walls immediately adjacent. For small coops a hand atomizer will suffice for applying insecticides as sprays but for larger houses a bucket pump, knapsack sprayer or barrel pump is desirable. A rather coarse spray should be applied from all angles and thoroughly driven into the cracks. The floor also should be treated, as many mites fall to the floor when the roosts are being removed.

In tests conducted during the last four years different material used as sprays have proved effective against mites. Commercial carbolineum which consists essentially of a high-grade anthracene oil has proved very effective. The killing power of this substance, which is derived from coal tar, lasts for several months, and mites which may be inclined to come in from other buildings are repellod for a long time. This material is rather expensive—about $1.00 per gallon—but since the number of treatments necessary to control an infestation of mites completely is less than when any other known material is used, its application is strongly advised.

Crude petroleum, while not as effective as carbolineum, retains its killing power for several weeks, and in most localities is very cheap. Since it does not dry into wood so rapidly it is more likely to soil the fowls and clothing. Both of these materials can be sprayed better if reduced with kerosene at the rate of about 1 part of kerosene to 3 parts of the other materials. Both of them often contain foreign particles which should be strained out before the spraying is begun. It has been found that one thorough application of either of these materials will often completely eradicate the mites from an infested chicken house, but ordinarily it is advisable to make a second

application, a month after the first and in some cases a third treatment is required. These subsequent applications may be made with a brush, the materials being used pure and only the roosts, their supports, the walls adjoining, and the nests if they are infested, being covered. This method of application is effective for the first treatment also if the houses are not heavily infested. Poultry should be kept out of the treated buildings until the material is well dried into the wood.

It is advisable to spray or paint chicken coops a few days before putting broods of young chicks into them.

In spraying hen houses care should be exercised to prevent the spray from striking chickens around the building. This is especially important with young chicks.

Pure kerosene and kerosene emulsion in double the strength ordinarily applied to plants will destroy all mites hit, but these substances have not body enough to destroy those mites which are in more protected situations, and several applications at 10-day intervals are needed to destroy all the mites

Arsenical dip, such as is used to destroy cattle ticks, has been found fairly satisfactory for use against chicken mites. Several applications are required to eradicate the mites from poultry houses. In regions where cattle dipping is practised, and this solution is readily available it is perhaps the most convenient and cheapest material to use. Of course due care should be taken to avoid the accidental poisoning of the fowls. The standard coal-tar stock dips, used in solutions slightly stronger than are recommended on the cans, will destroy all mites reached by the spray, and in addition their germ destroying properties are a desirable feature.

ROOSTS AND NESTS.

It is advisable to put in new roosts after the first spraying. The roosts should never be nailed to the side of the building but arranged so as to be easily removable. It is further pointed out, however, that roosts can to advantage be made by suspending a frame from the ceiling on

baling wire and place the roost across this frame. None of the structure should however be allowed to come in contact with the walls, and there is then little opportunity for mites to reach the chickens.

If convenient the nests should be entirely apart from the roosting quarters. They may consist of boxes, which are easily handled, cleaned, or if infested destroyed. A series of nests made of boards is not objectionable if placed on a framework free from the walls of a henhouse and easily removable for cleaning. The simple arrangement devised by Professor Herrick is recommended. Wooden or iron brackets are fastened to the wall and upon these are laid a 12 inch and a 6 inch board, the latter behind. These form the bottom of the nest and a shelf for the fowls to stand on in entering the nests. The back of the nests is formed by the wall and the partitions are made by cutting a 12 inch board into pieces 12 inches long held upright by a 1 x 3 nailed on top even with the back edges and a similar strip nailed along the front of the bottom. The partitions and the bottom can be readily lifted off and thoroughly cleaned and the wall behind treated. Usually it is advisable to hinge to the wall a sheet of corrugated iron in such a way as to form a slanting roof over the nests to give seclusion and prevent fowls from roosting on them.

Great care should be taken to keep nests occupied by sitting hens free from mites. It is hard to work effectively against the mites when many hens are brooding; moreover, oil used freely about the house at any time may soil the eggs and prevent successful hatching. Infested quarters, therefore, should be treated thoroughly before hens are set so as to start them in nests which are absolutely clean. Beneath the straw of the nest a layer of lime and sulphur will tend to prevent mite breeding, and the entire nest may be dusted occasionally with pyrethrum. Broken eggs and the straw soiled by them should be removed promptly, as they tend to attract mites.

In case an infestation of mites is discovered in nests where hens are sitting it is advisable that the corners and cracks of new nest boxes be painted with carbolineum,

after which the hens should be supplied with new nest material and the eggs and hens transferred during the day time. The old nests should be burned or well sprayed.

When poultry are to be transferred to new quarters it is desirable that they be kept three days and nights in a pen so that the mites will leave them before their introduction into the new building. The roosts in the new building and in the quarantine cage should be treated in order that any mites which have left the fowls may be destroyed.

It is mentioned in the Journal of the Jamaica Agricultural Society that it is most essential that all troughs in which water is placed for both fowls and chickens be kept scrupulously clean, and a small piece of Camphor placed in each will prevent any case of slight colds spreading and developing into anything more alarming. The pieces of Camphor can be replaced in the troughs until there is a great diminishing in size to say one third of their original size.

This is a good practice but we think that a few drops of Eucalyptus Oil in the water is still better to prevent roup, and if it occurs to prevent its spreading.

It must be noted that by camphor we mean real Camphor not what are sold in the chemists shops as "Camphor balls" and which are composed of Naphthalene.

The practice of adding the smallest pinch of Permangenate of Potash crystals to the water, just enough to colour it a rosy pink, is also to be commended as a general practice.

For Dairies.—"A French journal states that it has been found that flies have a great objection to the colour blue, and if buildings infested with flies are washed with a blue

instead of a white wash flies will desert the place. In support of this the following instance is reported : —

A farmer had 170 cows housed in different sheds; they were festered with flies, but he observed that in one shed the walls of which were of a blue tint, the cows were not worried. He therefore added a blue colour to the lime with which he washed the buildings, and from that time the flies have deserted the place. The follwing formula is used by him for the wash : To 20 gallons of water add 10 lbs of slacked lime and 1 lb ultramarine.

BOTANICAL NOTES.

SOME INTERESTING SPECIES OF PALMS.

Thrinax Morrisii, a pretty dwarf fan-leaved palm of the West Indies. Stem 4-5 inches diameter with aerial roots. Leaves, 2-2½ ft. across. Segments cut about 12 inches deep, points again cleft 2 inches, the base near the ligule turning upwards in small segments, back of leaf quite silvery. Petiole slender, smooth, 3 feet long. Inflorescence interfoliar; Spadices 3-3 feet 6 inches long, stems glaucous; branches 3 inches apart 5-6 inches long, secondaries small, wiry, 2-3 inches, all yellow. Flowers tiny, white. Fruit very small, like pepper corns, turning white.

Thrinax argentea, The "Silver Thatch" palm of the West Indies. Tall growing with a slender stem not more than 4½-5 inches in diameter, regular. Foliage fan-shaped, 3-4 feet across, the Segments cut to more than half its depth, the points entire or slit very little; the sides of the leaves meeting. The under side of the leaves is quite silvery, from which the name "Silver Thatch" is derived; petiole slender, 3 feet long. Inflorescence interfoliar; Spadices 2-2½ feet long, slender, compound; branches pendant 6-7 inches long, secondaries fine, simple, 2-2½ inches long, flowers small, white; fruit shining black, round, ⅜ inch diameter.

Thrinax parviflora, of Jamaica. A tall growing species, though less so than *T. argentea*. Stem 5 inches diameter, narrowing slightly; foliage 3 feet wide, plicate, of more solid substance than any of the other species; segments cut to about $\frac{1}{3}$ the depth, points slits about 2 inches, sides of leaves meeting and overlapping. Inflorescence among the lower leaves; spadices slender, 5 feet long, (the stalk 18 inches,) branches all pendant, 9-10 inches long, about 4 inches apart. Secondaries 3-4 inches, wiry. Flowers small, white; fruit white, fleshy, $\frac{1}{4}$ inch diameter like white currants. Seeds three-sixteenth inch diameter.

Thrinax barbadense. This plant may easily be mistaken for *T. argentea*, as the two are very similar, the foliage is however larger, 4-5 feet across, of more solid substance, though not so solid as that of *T. parviflora*,—the segments cut to $\frac{1}{3}$ the depth, and the points slit to 6 or 7 inches. The spadices are similar to those of *T. argentea* but smaller, the fruit is also smaller, black. It may however be distinguished by its large ligula, which is broader and flatter than that of the other species, and the under side of the leaves is not silvered.

Ptychoraphis augusta, from Nicobar. A very handsome palm and exceedingly showy when in fruit. Stem columnar, 8 inches diameter, grey, rings 2 inches apart. Foliage 11-12 feet long, petiole a few inches only, leaflets in 2 ranks in pairs, set an inch apart, drooping suddenly, 2-2$\frac{1}{2}$ feet long, 1$\frac{1}{4}$ inches wide, with several longitudinal ribs, pale green. Spadices below the leaves, heavy, compound, spreading 3 feet, branches simple 15-18 inches long, the end 6 inches occupied by male flowers. Flowers white. Fruit bright red, $\frac{7}{8}$ inch long, $\frac{1}{4}$ inch wide, hanging like narrow bunches of grapes without branches.

Coleospadix oninensis from New Guinea. Several tall slender stems not more than 1$\frac{1}{2}$ inches in diameter. Foliage pinnate, 3 feet 6 inches long, pinnae very narrow, 12-15 inches long. Spadices below the leaves in a compact bunch of small wiry branches 6-9 inches long. Flowers tiny; fruit very small, bright red.

Bentinckia nicobarica, from the Nicobar Islands a handsome single stemmed palm of the habit of *Archontophœnix*. Stem columnar, grey, 9 inches in diameter, rings 3 inches apart. Foliage stout 10-11 feet long, slightly drooping. Leaflets 2-2½ feet long, 1½ inches wide, set closely in 2 ranks, (leafstalk only a few inches long). Inflorescence below the leaves. Spadices heavy, compound, white when young, spreading over 2 feet and 2½ feet long. Branches quite strong, secondaries simple, wiry 6-9 inches long. Fruit ½ inch by ⅜ inches dark brown, almost black; seeds round half the size.

J. F. Waby.

MEAL AS AN ANTIDOTE TO CERTAIN VEGETABLE POISONS.

A note in *Botanical Abstracts*, January 1920, draws attention to a passage in the Bible (ii Kings, iv 31-41) where an account is given of the accidental poisoning of a band of Prophets and the antidotal means employed by their leader, the prophet Elisha. The Hebrew name of the plant that caused the poisoning may be translated as Paggù ôt, and the antidote used was meal. The derivation of the Hebrew name is given and it is shown from both the botanical and archaelogical histories, that it applies rather to the wild *Colocynth*, *Citrullus Colocynthis*, than to the squirting cucumber, *Ecballium Elateruim*. Both are dangerous poisons, producing entiritis and even death. To test the use of meal as an antedote, experiments have been carried out on dogs. A striking account for the explanation of the prophets on eating their pottage, of which the wild Colocyth was a part, rendered the otherwise poisonous and lethal doses of the plant under discussion innocuous, substantiating the truth of the biblical passage, and sustaining the popular first aid maxim to give flour in many cases of poisoning.

—*Agricultural News.*

HYBRID BOUGAINVILLAEAS.

In the Report on the Agricultural Department, St. Vincent, for the year ended March 31, 1919, Mr. Sands, then Agricultural Superintendent of that island, notes that the receipt of some seeds of Bougainvillaea hybrids from Dr. Perez of Teneriffe, and the flowering of two of the plants raised from the seed so obtained, led to a good deal of attention being devoted to the question of obtaining seed from the different varieties cultivated in the Botanic gardens, St. Vincent. These were: the three varieties with magenta bracts, namely, *Bougainvillaea glabra*, *B. sanderiana*, and *B. spectabilis*; the one with terra-cotta bracts, *B. laterita*; and the crimson variety commonly known as 'Mrs. Butt.'

Repeated attempts were made to self-fertilize the flowers, but unsuccessfully. On the other hand, the different varieties were found to cross readily with each other, although not a single seed of a natural cross had ever been found previously on the plants.

It takes about thirty days from the pollination of the flowers to the ripening of the seed and the seeds, which resemble grains of wheat, take ten days to germinate in partially sterilized soil.

Seedlings have been found rather difficult to raise; they are often lost through imperfect germination.

The two 'F' plants, raised from the seed obtained from Dr. G. V. Perez of the cross between *B. laterita* and *B. glabra*, have borne flowers with magenta bracts and glabrous leaves. The crosses made in St. Vincent between *B. laterita* and the crimson variety 'Mrs. Butt,' as well as those between *B. laterita* and *B. sanderiana* have given indications of segregation at an early stage. The flowering of these is awaited with interest.

It seems probable that the magenta colour in the bracts is dominant over the crimson and terra-cotta red, as all hybrids raised in the West Indies, so far as is known, in which a magenta-bracted species was one of the parents, have produced magenta-coloured bracts.

—*Agricultural News.*

VALUE OF SUNFLOWERS.

We were interested in reading what is somewhat of a discovery with regard to Sunflowers We all know the use of the seeds for bird feeding, and large quantities used to be grown in Southern Russia for the making of sunflower oil. We read now that the stalks and heads are largely used as cattle feed. For some years hundreds of acres of high-priced irrigated land in California have been used for the growing of sunflowers, and it has been found to be a paying proposition to grow this crop there for feeding dairy cattle. In Southern Alberta large quantities are now grown for the same purpose.

The crop it is stated, gives a surprising yield on good lands under irrigation, and it is considered probably the heaviest yielding fodder crop known. It gives from 15 to 25 tons of forage per acre. Cattle eat it with great relish both in the fresh or green stage and as ensilage, while this food has a valuable effect on the milk flow of dairy cows. We here have only grown sunflowers as ornamental plants, but in districts with irrigation, where green food is wanted, some might be tried on some scale.

—*The Journal of the Jamaica Agricultural Society.*

REPORT ON TESTS OF WOODS FROM BRITISH GUIANA BY THE FOREST PRODUCTS LABORATORIES OF CANADA.

At the request of Mr. Watson Griffin, Superintendent Commercial Intelligence Branch, Ottawa, Canada, samples of 5 British Guiana woods were shipped on 30th March, 1918, and were tested as to their characteristics. The samples were received at the Forest Products Laboratories of Canada on 31st July, and their report issued on the 29th August, 1918.

The following is a summary of the report, from which extracts have been freely made, of the mechanical tests carried out under the direction of Mr. W. B. Stokes, Division of Timber Physics, and Mr. R. W. Stems, in charge of the Division of Timber tests.

The 5 samples were sent in the form of two planks of each of the following species, viz :—

1.	B.G. Mahogany (Red Crabwood)	Carapa guianensis
2.	Determa	Nectandra sp.
3.	Purpleheart	Copaifera (pubiflora ?)
4.	Locust	Hymenoea (Courbaril ?)
5.	Mora	Dimorphandra mora.

These planks were each 6 ft. long by 9ins. by 1¾ to 2 ins. and were obtained from (1) The Demerara Railway Coy., Ltd ; (2, 3, 4,) Sprostons, Ltd ; and (5) from the Georgetown Coconut Estates, Ltd.

The specimens, including a specimen of American Walnut, as prepared for testing were of square or approximately square section as large as could be worked from the material (from 1½ to 2 inches square). Two additional cubes of each species of the same section as the mechanical test pieces were prepared for hygroscopicity tests.

The tests were made in a 30,000 pound capacity Olsen Universal testing machine driven by an electric motor so as to give the following constant head speeds for each test :—

	Rate of descent of loading hd. Inches per minute.
Bending	0.105
Compression	0.024
Hardness and cleavage	0.25

The bending test pieces were supported on a span of 28 ins, and loaded in the centre. Roller bearings permitted the specimen to move freely in the end supports and prevented any fixing moment. Thin steel plates between the loading head and the specimen prevented local crushing at the centre.

In the compression tests a spherical bearing block was inserted between the specimen and the weighing table of the testing machine, so that correction could be made for any slight inaccuracies in the preparation of the ends of the specimen. These, however, were cut very carefully with a special smooth-cutting saw and were all quite true.

Hardness and cleavage tests were made with special apparatus.

Specific gravities and weights per cubic foot were calculated from carefully made measurements and weights of the mechanical test pieces.

The results of the various tests are summarized in the table attached hereto, which gives the average values for each species tested, together with the number of tests upon which the figures are based. The wood was seasoned by being kiln dried.

TABLE OF AVERAGE RESULTS OF TESTS ON 5 SAMPLES OF B. GUIANA WOODS.

SPECIES.		Specific gravity based on weight when oven dry and on volume when tested.	Weight per cubic foot as tested	Moisture content based on weight of wood when oven dry.	STATIC BENDING. Fibre stress at elastic limit, per square inch.	STATIC BENDING. Modulus of rupture per square inch.	STATIC BENDING. Modulus of elasticity per square inch.	STATIC BENDING. Work in bending per cub. in. of specimens to elastic limit.	Compression parallel to grain. Crushing strength of maximum load per square inch.	HARDNESS. Load required to imbed a 0.444 inch sphere of steel to one half its diam. Radial Surface.	HARDNESS. Tangential Surface.	HARDNESS. End Surface.	CLEVAGE. Splitting strength per inch of width of specimen 3 ins. long.
			lb.	Per Cent.	lb	lb.	1000 lb.	Inch lb.	lb.	lb.	lb.	lb.	lb.
Crabwood	No. of tests ...	19	19	25	4	4	4	4	11	4	4	4	6
	Average value ...	0·573	40	11.5	9,760	17,200	2,197	2.41	8,980	1,238	1,198	1,534	290
Determa	No. of tests ...	12	12	19	3	3	3	3	6	3	3	3	6
	Average value ..	0.517	39	22.9	5,580	9,200	1,733	1.01	5,660	598	616	548	214
Purple Heart	No. of tests ...	12	12	18	3	3	3	3	6	3	3	3	4
	Average value ...	0.740	53	14.2	13,450	23,070	3,154	3.20	13,210	1,997	2,182	2,250	378
Locust	No. of tests ...	13	13	20	3	3	3	3	8	3	3	3	6
	Average value ...	0.657	47	15.0	8,500	15,690	2,153	1.88	8,66C	1,630	16,70	1,896	399
Mora	No. of tests ...	13	13	19	3	3	3	3	7	3	3	3	6
	Average value ...	0.867	67	21.4	11,06C	17,920	3.583	1.91	9,980	1.865	1,909	1,925	416
Black Walnut	No. of tests ..	22	22	29	2	2	2	2	16	5	5	5	6
	Average value ...	0.590	41	12.0	7,160	13,770	1,656	1.72	7,940	1,192	1.362	1,616	453

The weight-per-cubic foot figures given in the table are for the wood as received and tested (containing different amounts of moistures). The moisture content of the diffent test pieces of each species varied more or less the variation being least in crabwood, which had seasoned with remarkable uniformity, and greatest in Determa, which was very poorly dried, the centre portions of the plank being quite wet, while the exterior was dry. The same condition occurred in Mora but to a much less degree. (The range of moisture contents for Determa was from 11.7 to 47.6 per cent.)

The average moisture contents of the different species also vary considerably: Crabwood and Walnut about 12 per cent., Locust and Purpleheart about 14, and Determa and Mora nearly 22 per cent.

Variation in moisture content affects strength very considerably; accordingly the test results, to give a true idea of the relative strength of the different species, should be corrected for differences in moisture content. Multiplying the average strength values by appropriate constants the following table shows the results corrected to 12 per cent moisture.

TABLE OF RESULTS CORRECTED TO 12 PER CENT. MOISTURE

Species.	Specific gravity based on volume when green and wt. when oven dry.	Wt. per cu. ft. lbs.	Static Bending. Fibre stress at elastic limit.	Static Bending. Modulus of rupture.	Static Bending. Modulus of elasticity 100 lbs. per sq. inch.	Compression parallel to grain. Max. crushing strength. lbs. per sq. inch.
			Pounds per square inch.	Pounds per square inch.		
Mora ...	0.867	61	15,820	25460	4159	15,770
Purpleheart ...	0.740	52	14,660	24900	3230	14,660
Locust ...	0.657	46	9,270	16940	2240	9,610
Crabwood ...	0.573	40	9,760	17200	2197	8,980
Determa ..	0.517	36	7,980	13070	2010	8,940
Walnut ...	0.590	41	7,160	13770	1656	7,940

It is known that wood becomes harder as its moisture is reduced, and that its splitting strength is also increased somewhat. No strength-moisture correction factors have been determined for these tests, so it was not possible to apply correction to the hardness and cleavage test results.

It was remarked that the Walnut test material varied widely in properties in different pieces. Specimens of fast growth material were fully twice as heavy as less dense material of slower growth, and correspondingly harder and stronger.

In the hardness tests Determa was peculiar in being softer on the end wood than on the side, all other species had end-hardness considerably greater than side hardness. In the resistance to cleavage test Locust was remarkable in that, in all cases, its strength was about twice as great if split tangentially than if split in a radial direction. Walnut, Mora and Determa similarly had greater tangential than radial splitting strength but the difference was much less. In Purpleheart and Crabwood, on the contrary, the radial splitting strength was slightly greater than the tangential.

With regard to the fractures of the bending test pieces, in all cases the compression failure on the top of the beam appeared first followed sooner or later by the tension break on the bottom face. The characteristic failures were as follows :—

Crabwood.	Tension failure long and splintering fairly well localized in centre of beam.
Determa.	Tension failure short and rather brittle; break did not extend more than 1 or 2 inches each way from the centre.
Purpleheart.	Tension failure very long and splintering; failure was apt to extend some distance through the beam.
Locust.	Compression failure did not appear until the beam had deflected very considerably. Long splintering tension failure occurred soon

after. The specimen plank as sawed had slightly diagonal grain, hence the coarse cross-grained failure.

Mora. Compression failure appeared early in test and specimen crushed more than half way through the depth of the beam before the rather short splintering tension break developed.

Walnut. Specimens deflected very considerably before compression failure appeared. Tension failure followed soon after.

The failures in the compression parallel to grain tests did not differ very much in the different species. The characteristic failure was by shearing at an angle of about 60° right across the test piece. The Determa test pieces showed a greater percentage of crushing failures (i. e. the parts on either side of the break instead of shearing over each other on a plane oblique to the axis, crushed into each other on a plane nearly perpendicular to the axis) and the failures were in general very coarse and ragged. A large percentage of the Walnut compression pieces failed by buckling and crushing (i. e. they bent, and crumpled on the inner side of the bend).

The hygroscopicity tests were made to determine the effect of moisture (vapour and liquid) upon the woods. The test pieces were cut into cubes as near to 2 x 2 x 2 ins as the size of the material allowed ; some being only $1\frac{1}{2}$ x $1\frac{1}{2}$ x 2 ins. The sequence and method of the tests were as follows;—

Weighed (to nearest 1/10th of a gram) and measured (to one-thousandth of an inch by special screw micrometer).

Dried (in an electric oven at temperature of boiling water for 1 week.)

Weighed and measured.

Placed in moist chamber for 1 week, through which a slow current of air passed having a constant relative humidity of 80-85 per cent and a temperature of 71° F.

Weighed and measured.

Soaked in water for 24 hours and kept totally immersed by means of a weighted perforated plate.

Weighed and measured.

It was noted that 2 samples of Black Walnut differed widely in density, 1 sample being of more rapid growth with 33 per cent. greater density than the other, and attention is drawn to this condition which might obtain in other woods when imported in any quantity.

The following table gives the results of 2 of the tests, in the orders of merit in which the woods are arranged inversely to their absorptive powers of moisture, and variation in volume under the 4 different conditions of the woods, viz :— as received, oven dry, after one week in moist chamber, after 24 hours in water, and hence their swelling action on the woods.

Absorption of water by the specimens		Variations in value of the specimens.	
Order of merit as regards resistance to a moist atmosphere.	Order of merit as regards resistance to a moist atmosphere and soaking in water.	Order of merit as regards resistance to swelling action of moist atmosphere.	Order of merit as regards resistance to swelling action of moist atmosphere and soaking in water.
Determa	Determa	Black Walnut	Crabwood and Black Walnut
Crabwood	Crabwood	Determa	
Black Walnut	Purpleheart	Locust	Purpleheart and Locust
Purpleheart	Mora and Black Walnut	Purpleheart	
Locust		Crabwood	Determa
Mora.	Locust.	Mora.	Mora.

It is noted that the action of moist air or of moist air followed by soaking caused a small and nearly equal swelling of all the woods. Mora is the least favourable species in this respect but there is little to choose between the others.

Conclusions :—

1. Making allowance for differences in moisture content, all 5 Guiana woods prove to be stronger than Walnut in both bending and compression.

2. All, also, were considerably stiffer than Walnut.

3. All, wi h the exception of Determa, had more elastic toughness. (No correction for moisture differences possible).

4. All, however, were weaker than Walnut in resistance to splitting. (No correction for moisture differences possible).

5. Purpleheart, Mora and Locust were harder than Walnut, Crabwood, Determa softer. (No correction for moisture differences possible.)

6. On the basis of the weight of the wood when oven dry, Mora, Purpleheart and Locust are heavier than *Walnut, Determa and Crabwood lighter.*

7. Very little difference was noted in the behaviour of the 6 species as regards swelling when exposed to moisture. Mora expanded slightly more than the other species.

8. Crabwood and Locust, approach most nearly to the properties of Walnut. Locust is slightly heavier; stronger, tougher, stiffer and harder, but offers less resistance to splitting. Crabwood is slightly lighter than Walnut and stronger, stiffer and tougher, but it is not so hard, nor strong in resistance to splitting. Determa is a lighter wood, is very considerably softer and offered least resistance to splitting of all 5 species.

9. Different samples of Walnut varied as much as 100 per cent. in density strength and hardness.

10. Tropical woods of widely different properties are sometimes so similar in appearance that one might readily be mistaken for the other. It would therefore be desirable to have a careful examination made of the structure of any tropical wood which it is proposed to use commercially, in order that positive identification can be made in case of doubt.

L. S. Hohenkerk,
Forestry Officer,
Department of Lands and Mines.

GRADING UP THE HERD.

A successful cattle industry depends largely on the grading of the herd. In all cattle raising countries this is considered of primary importance. The following article written by Mr. R. T. McKenzie, Dairy Supervisor, Department of Agriculture, Victoria, Australia, is of general interest and should be of value to ranchers and dairymen.

It is apparent that there is a good deal of confusion existing in the minds of most dairymen as to the general principles of breeding. If it were not so, we should see more pure-bred bulls amongst the dairy herds of the State. A large amount of money is lost annually through ignorance or indifference on the part of breeders in using "scrub sires." The principles of breeding, through the work of investigators working on Mendel's laws, have been placed on a sound basis, and the observance of mere elementals would accomplish substantial results.

The estimated yield of butter fat per cow in Victoria is about 150 lbs. per year. It is no exaggeration to say that it could be increased to 250 lbs. in the course of a few years by careful selection of dams and the use of pure-bred sires.

It was my privilege recently to visit some countries where the farmer appreciates the value of a pure-bred sire and where many organisations, known as "Bull Clubs," are in existence for the purpose of providing approved sires, and in such countries "scrub" bulls are nowhere to be found. The advantages of this scheme are manifested in the increased returns to the dairyman as compared with our own State. The average production of butter fat per cow in Denmark is 240 lbs., in Sweden 230 lbs., and Holland the same.

Articles from time to time have appeared in this Journal stressing the importance of this question, and the Department a few years ago in a practical way, by placing pure-bred bulls in some districts for the use of settlers, showed with what importance the matter is regarded. Notwithstanding these efforts little progress has been made;

in fact, some men in a position to judge claim that there has been retrogression. The average farmer aspires after no standard. He does not appear to realize that the worthless cow requires the same time, care and attention as the profitable one, that the milking propensity is just as tranmissible through the male as the female line, and in the selection of a herd bull he is easy to please.

A dairyman cannot turn his attention to a more interesting or profitable occupation than the grading up of his herd, and few fields offer more room for improvement. That this can be accomplished by the introduction of an approved pure-bred sire the whole history of breeding demonstrates. It is full of examples of how breeders have selected towards a certain standard until an animal has been evolved far superior to any of the original stock.

The dictum "that like begets like" is one of the accepted principles of breeding and generally, with some important modifications, it is true. If one consistently culls from his herd the inferior cows and uses a sire having the characteristics he desires to perpetuate, a substantial improvement must be effected. Whatever the breed, the first stage of improvement must begin with the male, because the cow has only one calf a year and her influence is limited accordingly, whereas the bull may sire all the calves in the herd if it is not a large one, exercising a powerful influence on every calf. That influence will be seen in successive generations, the good qualities of the bull becoming more firmly established, while the qualities of the original stock will become recessive.

In choosing a pure-bred bull a knowledge of his pedigree and the milking qualities of his maternal ancestors is essential. It is not sufficient to select a bull because he may be a beautiful specimen of his breed, possessing all qualifications looked for in the show ring. That is judging on appearance and indicates only about one-quarter of his value for dairying purposes. What is required in a bull of the dairy type is a combination of appearance and milking qualities, but above all, the bull intended for use in a grade herd should be selected mainly for his power to trans- to his offspring milking and butter fat propensities.

Much of the future can be foretold by a study of the past. A good dam and grand-dam go a long way towards establishing desirable qualities in a bull; as a matter of fact, according to Galton's laws of heredity the influeuce of any ancestor further back than the third generation is infinitesimal.

No great development can take place in the dairy herd unless accurate and complete records are kept, because they form the only safe data for judging dairy cattle. Milking qualities are largely hereditary, and the progeny are likely to inherit the milking characteristics of the dam. It is therefore of fundamental importance that the dairy farmer should have a true record of the performances of his herd, so that he will be enabled to select the heavy milkers for breeding purposes. The possession of milk records is not only a valuable guide for breeding purposes but is a good asset for sale purposes. In Denmark the price of a cow is often regulated by her milk records. The owner, through the operation of the Control Societies, is able to furnish an authentic history, not only of the dam, but of several generations, with information of milking qualities likely to be transmitted. Many cattle are sold without the purchaser having previously seen them, the purchase being determined purely through this "pedigree of performance."

In order that the improvement may be made continual from generation to generation only heifers from tested cows should be used, and with a pure-bred bull for siring, development is certain.

The writer visited a herd of cows in the south of Sweden which the owner (Mr. Lars Larsen) stated produced one-half more butter fat per year than the original cows that founded the herd. This was achieved in six years by careful selection of dams and the use of a "tested" pure-bred bull. A "tested" bull is one that has demonstrated that he can beget offspring superior to the dams. Such a bull has a positive breeding value. "Scrub" bulls have a negative breeding value for practically in every case the offspring gives less milk than the mothers did.

In some cases, perhaps, dairymen are deterred by the high cost from purchasing a pure-bred bull, but probably no more economical investment can be made, as is shown by the following particulars obtained by the writer from Mr. F. Linde. when on a visit to his farm at Odense, Denmark. Mr. Linde purchased a "tested" pure-bred bull for £100, selling three of his cows to provide the purchase money. This bull increased the milking capacity of his daughters by 1,000 lbs. of milk and the butter-fat test ·75 per year, as compared with the dam.

The dams over a period of six years averaged 5,672 lbs. of milk, butter-fat test of 3.5 per year. The daughters during a six-years' test averaged 6,680 lbs. of milk with a test of 4.25. The following table will illustrate the position:—

Cows	Average Yearly Milk Production	Average Butter Fat Test.	Average Yearly Fat Production	Increase per Year of Daughters above Dams.	
				Mi k.	Butter Fat.
	lbs.		lbs.	lbs.	lbs.
Dams ...	5.672	3.5	198.5	...	...
Daughters..	6,680	4.25	283.9	1,008	85.4

The total increase for the whole herd of thirty cows for *the six years was 181,440 lbs. of milk and 15, 372 lbs. of* butter fat. If we estimate the value of butter fat at 1s. per lb, the extra yearly income was £128. 5s., or a total for six years of £745 10s. The average yearly return of the dams was £9. 18s. 6d. for the daughters £14. 4s.—a difference in favour of the latter of £4. 5. 6d. Who will say that this pure-bred bull did not show a handsome profit? The records of the daughters do not show altogether the full value of this bull, for his influence on the subsequent generation must be taken into account; his grand daughters

inherited his milking qualities and added very materially to the productiveness of the herd.

Many similar instances showing the value of a pure-bred bull could be quoted. The sooner dairymen discard the mongrel sires at present in use and replace them with pure-bred animals—and the Government herd-testing records make a wide choice possible—the sooner results will be obtained that more nearly approximate those of the other great dairying countries of the world.

—*Journal Department of Agriculture, Victoria.*

RICE PRODUCTION, SURINAME, IN 1919.

District.	*Bags of 140 lbs.*
Nickerie	44,306
Beneden Commewijne	34,663
Boven Commewijne	12,880
Beneden Saramacca	27,525
Boven Saramacca	883
Beneden Suriname	25,181
Boven Suriname ...	9,112
Beneden Para .	17,795
Boven Para .	12,096
Cottica ..	23,357
Coronie ..	1.130
Marowijne ..	130
Total production, Suriname ...	209,058

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The production of paddy in Surinam in 1918 is stated to have been 119,542 bags. This increased to 209,058 bags in 1919. The yields in British Guiana during the years were returned as 592,000 and 1,063,008 bags of 140 lbs of paddy respectively.

CLIPPINGS.

VARIATION IN COCONUTS.

Some years ago a bunch of coconuts was obtained from the North-Western Province, which bore both yellow and green nuts. Of the five nuts on the bunch, three were green and two yellow. The main stalk of the bunch was longitudinally striped with green and yellow, the side branches which arose from the green areas being green and bearing green fruits, while those arising from the yellow areas were yellow and bore yellow fruits.

Two nuts of each colour were planted, but only two germinated, fortunately one of each kind. These two plants, have since been growing side by side. The plant from the yellow nut has a distinct yellow tinge, with a yellow or bronze midrib to the leaves.

The two plants, though still small, are now beginning to show a distinct difference in size, the leaves of the green plant being noticeably longer than those of the yellow.

The occurrence of yellow nuts on a tree which otherwise bears green nuts is an instance of what is usually known as chlorosis; i.e., a deficiency, or marking, of the green colouriug matter of the plant. It would be expected that in such a case the yellow plant would be of slower growth than the green one. The precise form of this particular example of chlorosis has not yet been determined as it has not been possible to devote time to its examination.

The interest of the case, however, lies in the fact that it indicates that the yellow varieties of coconuts may have originated as similar "sports" from the normal green varieties; and the practical bearing of this is that, unless yellow varieties are desirable on account of other qualities they should not be planted because their slower growth, owing to their chlorolic condition, will render them less profitable than the green varieties.

—*Tropical Agriculturist, January, 1920.*

NITROGEN FIXATION IN TROPICAL SOILS.

The need for further investigation into the causes of variation in the rate of nitrogen fixation in Indian soils is called attention to by Mr. C. M. Hutchinson B. A, Imperial Agricultural Bacteriologist, Pusa, in the Agricultural Journal of India, Vol. xiv., Part 2. He says :—Observations made at Pusa of the rate of fixations of nitrogen both in field soils and in the laboratory, have confirmed my opinion that, not only is the amount of nitrogen taken from the air and added to the soil by azotobacter of considerable economic importance, but that this amount may vary within such wide limits that it seems highly probable that were we in possession of more accurate information as to the causes of such variation, we should be able to increase this amount very considerably, quite possibly by mere soil management such as is made use of to secure nitrification, or possibly the addition of some stimulating substance which may be absent in some soils.

One important factor in the fixation of nitrogen in soils is probably the continuous and concurrent removal of the products of the bacterial action involved in the process of fixation. Another is the provision of carbohydrates to supply the bacteria with the necessary energy. But we have only to suppose a symbiotic relationship between azotobacter, which is the chief nitrogen-fixing bacterium and green algæ, to see how the process can proceed, limited only by the neccessary soil moisture, and the presence of such inorganic salts as are requisite for the growth of these organisms.

The practical value of fully understanding the process of nitrogen fixation is demonstrated by the fact of its importance. In certain Punjab soils, nitrogen fixation leads to the addition of as much as 30 per cent. to the nitrogen content of the soil during the year.

—*The Australian Sugar Journal.*

THE MOVEMENT OF PLANT-FOOD WITHIN THE SOIL.

In connexion with work on this subject Van Alstine started a series of experiments to determine the total amount of various plant food elements in the surface and the lower strata of the soil and trace the ultimate fate of the plant-foods added in the form of fertilizers. As a result of his work he comes to the following interesting conclusions: (a) Phosphorous remains where it is applied in the soil, until removed by the crops or by erosion; (b) The addition of alkali salts such as potassium sulphate seems to encourage the utilization of phosphorous; (c) In fully cropped land the nitrogen is more or less retained and when applied in the form of Ammonia it is retained in the surface soil, in the debris and roots of plants; (d) Potassium has a tendency to get leached out very soon by passing into the lower substrata; (e) Carbonates are washed out from the soil especially when ammonium salts are added which are also responsible for loss of magnesium and calcuin from the soil.

—*Journal of the Mysore Agric. and Expt. Union, Vol. 1 No. 2.*

INFLUENCE OF PLANT-RESIDUES ON NITROGEN FIXATION.

During the course of investigation on this subject, Hutchinson has come to the following conclusions:—The estimated loss of nitrogen by disappearance of nitrates in the soil is not a real loss because there are several organisms known to have the capacity of assimilating nitrogen in the form of a nitrate and elaborating it into Protein. Even under conditions most favourable for true denitrification upwards of 25-30 per cent. of the total nitric nitrogen can frequently be recovered as Bacterial Protein. Nitrate disappearance does not therefore provide a true index of actual soil losses. Where the soil conditions are such that an excessive leaching of soluble nitrates is likely to take place, the retention of nitrates in the form of Bacterial Protein is an obvious advantage, The nitrogen content of the soil may be appreciably increased by the activity of azotobacter. When suitable carbohydrates including plant-residues are added to the soil. In actual experiments 6-9 mgms. of nitrogen per gram of plant-residue supplied has been obtained. Under favourable conditions 20-54 per cent of increased crop has been obtained from the application of carbonaceous compounds (sugar) and as the plant residues resemble sugar they may also serve indirectly to enrich the soil nitrogen reserves. The other necessary conditions for nitrogen fixation are a suitable temperature, presence of phospates and a suitable basic material as calcuim carbonate.

—*Journal of the Mysore Agric: and Expt: Union, Vol. 1 No. 2.*

WEST COAST AGRICULTURAL ASSOCIATION.

REPORT FOR B. G. FARMERS' CONFERENCE HELD AT PORT MOURANT, BERBICE, 6TH AND 7TH APRIL, 1920.

We are glad to be able to report that during the year 1919, we obtained affiliation to the Board of Agriculture with the kind help of the President and the late Hon. Secretary of the B. G. Farmers' Conference.

Ten monthly meetings were held. The membership was increased by six making a total of forty-four. The financial statement disclosed to our credit a balance of thirteen dollars and seven cents. In this there is also an increase which is gratifying.

We are pleased to note the addition to the membership of Messrs. G. E. Anderson and R. Strang, of Plantations Leonora and Uitvlugt, respectively, who are Honorary Vice-Presidents and who through our advocacy have opened up cane-farmingin th e district on very easy terms, of which labourers should not fail to take advantage. Nearly one hundred acres have been taken up on these estates by our farmers and their wives, and families of the African and East Indian races.

Our President, Mr. A. D. Hack, and Messrs. Boodhoo and Richardson, Vice-Presidents, Rev. W. A. Deane Hony. Secretary and Mr. A. M. Barcellos, Treasurer, must be commended for the keen interest taken in the Association. We are pleased to record that our hopes have been realised, in regard to cane-farming on the West Coast.

We ask that the next Conference be held at Hague, West Coast, and that we be recommended to have our first Agricultural Show this year.

Our President and Hon. Secretary are now cane-farmers. Having obtained leave of absence for six months, the Rev Deane has left the Colony with our best wishes for the United States of America to attend the General Conference of the A.M.E. Church.

Promising to stand by the B. G. Farmers' Conference as hitherto, for the further agricultural development of our Colony, and depending upon all for assistance, we pledge ourselves to do our duty more zealously.

We welcome among our members Mr. Chas. Schmidt, a Trinidad Cane-farmer who has also stimulated cane-farming in our district. We may mention that Mr. J. T. Barrett, boat-builder at Pln. Leonora, is the first cane-farmer who cultivated cane for sugar-making on Pln. Leonora, and that our Association takes pride of place for having been the first agricultural concern on the West Coast, Demerara, it having been founded by our Hony. Secretary, Rev. Deane, at Anna Catharina in 1908.

In January and March monthly meetings were held when the President, Mr. A. D. Hack, and Mr. D. P. C. Lambert presided respectively. The balance sheet for 1919, was submitted by the Hony. Secretary, and forwarded to the Secretary of the Board of Agriculture.

REPORT OF PORT MOURANT-ROSE HALL FARMING ASSOCIATION, 17th MARCH, 1920.

On behalf of the Committee of the Port Mourant-Rose Hall Farming Association, I have the honour to submit a report of the work done during the year ending 31st December, 1919.

On account of the representations made to the Rose Hall Village Council, we have been able to merit the appreciation of its members, and as a result of the recommendations made, the fencing of the provision section has been put in good order and made secure from cattle.

This work now gives the farmers greater security of reaping a crop, as well as enabling them to cultivate a larger area of ground provisions.

Great interest is taken by cane farmers at present, to improve their cultivation and a desire is expressed to empolder another section of the provision farm for the purpose of planting canes in the near future.

A few beds of cane on the eastern section were accidentally set on fire. This lot was milled at the Port Mourant factory and gave a yield of $5\frac{1}{2}$ tons sugar.

The big crop was taken off by Pln. Albion and produced a yield of $120\frac{3}{10}$ tons. The estimated value of the sugar crop is about $12,136.22.

The rice crop was very favourable during the year under review. The success of this industry is entirely dependent on the supply of water which the Manager of Pln. Port Mourant gives whenever he is asked by the Village Council.

The cultivation of ground provision receives less attention than either cane or rice, but the reason is obvious.

For some time past, farmers have been complaining of the uncertainty of reaping a good crop, so whilst it is essential to increase the area, especially during these critical times, yet the fear is expressed that losses will occur as long as there is no pumping engine to relieve the floods caused by rain.

The Association was affiliated to the Board of Agriculture on 9th July, 1919, and received a grant of $17.50. Each financial member receives a copy of the Journal of the Board. On the roll there are 128 members, 54 being financial. The receipts for the year were $107.89. Expenditure, $67.27; Balance, $40.62.

At the fourth annual conference of the B.G. District Association this society sent two delegates, and on two occasions there was a representative at the Committee Meeting of the Executive.

WM. W. F. SULLIVAN,

Hon. Secretary.

ATTENDANCES AT THE DISTRICT GARDENS

Year.	Bourda.	Belfield, E. Coast.	Stanleytown, New Amsterdam.	Suddie, Essequibo.	Den Amstel.	Houston, E. Bank.	Wakenaam.	Total Attendances.
1912 ...	5,514	4,395	3,302	2,100	2,544	2,156	718	21,729
1913 ...	5,156	4,535	2,519	3,399	2,568	1,836	1,319	21,332
1914 ...	4,243	3,869	2,443	3,025	1,791	1,653	1,533	18,577
1915 ...	1,123	1,006	769	59	503	339	401	4,200
1916 ...	4,705	1,161	1,510	225	623	2,251	1,297	12,026
1917 ...	4,991	2,820	1,366	3,297	1,186	2,564	1,663	17,886
1918	4,834	3,081	1,653	2,671	2,162	2,790	2,067	19,258
1919	4,769	2,425	1,582	2,798	1,851	2,480	1,556	17,461
1920								
1st Quarter	1,325	749	445	397	595	840	483	4,834

EXPORTS OF AGRICULTURAL AND FOREST PRODUCTS.

Below will be found a list of the Agricultural and Forest Products of the Colony exported during the first three months of 1920. The corresponding figures for the two previous years and the average for the five years previous to that are added for convenience of comparison.

Product.	*Average 1913-17.*	*1918.*	*1919.*	*1920.*
Sugar, tons ...	23,615	17,757	22,180	19,449
Rum, gallons	1,369,870	359,129	1,865,365	669,845
Molasses, gallons	14,317	7,400	164,113	—
Cattle-food, (Molascuit) tons	938	575	435	260
Cacao, cwts. ...	49	50	None	8
Citrate of Lime, cwts.	9	None	5	44
Lime Juice, gals.	*17,287	1,800	None	—
Essential Oil of Limes, gals.	*251	None	5	—
Coconuts, thousands	543	305	1,456	1,615
Copra, cwts. ...	381	827	762	—
Coffee, cwts. ...	1,050	823	5,751	989
Kola-nuts, cwts. ...	12	None	None	10
Rice, tons ...	4,362	4,185	638	5,519
Ricemeal, tons ...	151	5	None	—
Cattle, head ...	256	154	None	—
Hides, No. ...	1,178	115	2,291	2,265
Pigs, No. ...	345	None	None	—
Sheep, head ...	6	3	None	—
Balata, cwts. ...	2,823	1,165	2,004	1,786
Firewood, Wallaba, etc., tons ...	3,128	1,770	231	1,063
Gums, lbs. ...	332	None	None	2,861
Lumber, cub. ft. ...	64,608	27,082	59,508	40,754
Railway sleepers, No.	5,231	4,000	1,308	3,310
Rubber, cwts. ...	21	52	42	100
Shingles, thousands	504	614	747	372
Timber, cub. ft. ...	41,150	2,060	8,137	14,799
Coconut Oil; gals....	*26,674	8,336	3,798	20,680
Charcoal, bags ...	14,042	8,295	11,941	13,689

No records available for 1913-6.

Meteorological Data—January-March, 1920.

1920 Months.	Rain-fall. Inches.	Number of days of rain. Under ·10 Inches	·10 to ·50 Inches	·50 to 1.00 Inches	1.00 to 2.00 Inches	Above 2.00 Inches	Total days	EVAPORATION Inches	Air Temperature and Humidity. Air Temperature Maximum	Minimum	Mean	Humidity
Botanic Gardens												
January ..	16 40	4	8	1	1	4	18	3.94	84.0	74.8	79.4	81.0
February...	6.38	8	8	,,	3	,,	19	4 46	83.5	74.3	78 9	80.3
March ...	1.93	8	7	,,	,,	,,	15	6.21	84.0	74.8	79.4	75.3
Totals & Means	24.71	20	23	1	4	4	52	14.61	83.8	74.6	79.2	78.8
Berbice												
January ...	11.49	6	9	2	3	1	21		95.0	75.0	85.0	80.5
February...	3 62	4	4	2	1	,,	11		94.0	75.0	84.5	79.2
March ...	2.44	2	6	2	,,	,,	10		92.0	76.0	84.0	70.3
Totals & Means	17.55	12	19	6	4	1	42		93.7	75.3	84 5	76 6
Onderneeming												
January ...	14.47	3	11	4	4	1	23		86.0	74.0	80.0	91.0
February .	5.85	2	5	2	2	,,	11		86.0	75.0	80.5	90.2
March ...	2.30	,,	8	,,	,,	,,	8		86.0	75.0	80.5	93.3
Totals & Means	22,62	5	24	6	6	1	42		86.0	74.6	80.3	91.5
Morawhanna												
January ..	32.74	7	11	6	1	6	31					
February..	12.25	4	8	3	1	3	19					
March ...	2.80	6	11	...	...	...	17					
Totals & Means	47.79	17	30	9	2	9	67					